eISBN 978-967-16145-1-8

Konvensyen Kebangsaan Kejuruteraan Pertanian Dan Makanan 2019
21 Mac 2019, Wisma Tani, Kementerian Pertanian Malaysia, Putrajaya

MSAE2019-AIT04

Challenges of Smart Farming in Oil Palm Plantation in Malaysia: An Overview

Ahmad Safwan, A. B.[1,], Zareen, Z.[2]*
[1,2] Faculty of Plantation and Agrotechnology, UiTM Melaka Jasin Campus, 77300 Merlimau Melaka
*Corresponding author. Tel.: +606-2645300, Email:zareen88@melaka.uitm.edu.my

Abstract
Smart farming refers to the efficiency in agriculture management. One of the component of smart farming includes the usage of wireless internet and Global Positioning System (GPS) which connected with drone, machinery and equipment without visiting the farm. In some research, smart farming is stated to become the future of agriculture sector in which helps to overcome several problems nowadays for example, labour shortage. Oil palm production has been one of the primary economic sector in Malaysia. At present, Malaysia accounts for an overwhelming contribution to world's palm oil production and export which is 39% and 44%, respectively. Recently there has been a big drop in oil palm price. Nonetheless, smart farming is still very relevant in oil palm plantation in order to reduce production cost. However the implementation of smart farming is not fully implemented and restricted on several factors such as cost, weak imperatives for change, interoperability of different standards, connectivity in rural areas, and lack of knowledge on several technologies.

Keywords: Oil palm, smart farming, limitation, barriers

Introduction

Oil palm (*Elaeis guineensis*) is one of the major commodities for Malaysia. The oil palm industry continues to be an important foreign exchange earner for the country, with export earnings amounting to RM 64.8 billion in 2008 (Ministry of Plantation Industries and Commodities, 2009). The oil palm total acreage has reach 5.77 million acres in which represented a total of 2.23% from the total of 258.9 million of available land in this country (Bernama, 2017). This shows that the oil palm is the leading commodities in Malaysia. The increasing supply and demand of oil palm plantation product causes several problems to occur and one of it is declining labour (Alam et al., 2015). In order to come out with solution is by initiating smart farming or precision farming.

According to Kevan Reval, (2016), the next few decades smart farming will becoming far more important than it is nowadays and farming look smarter by indulging new technology.

Smart Farming

Smart farming refers to the application of information and communications technology in agriculture. The integration can help to increase production efficiency and the quality of produce. The practices include the use of drones for monitoring, field analysis and spraying, Internet of Things (IoT), sensors and actuators, geo-positioning systems and big data.

Smart Farming Technologies

According to Balafoutis et al, (2017), smart farming technologies can be divided into three major categories. The first technology is data acquisition technologies. This category contains all surveying, mapping, navigation and sensing technologies. The second category is data analysis and evaluation technologies, consist of a simple computer-based decision models until complex farm management and systems of information including many different options and data. The third technology is about precision application a technology which contains all application technologies, focusing on variables-rates applicators and guidance technology.

Smart Farming in Malaysia

Smart farming in Malaysia is still not applied thoroughly. However there are some research and applications that have been reported. One of it was a pilot projects (2001-2007) initiated by Malaysian Remote Sensing Agency (MACRES) together with agriculture-related agencies and Universiti Putra Malaysia (UPM) which conducted at Sawah Sempadan. This research focused on the development of Spatial Decision Support System for efficient management of paddy farms. It includes yield mapping, soil variability mapping, water management, variable rate treatment and GIS modelling (Malaysian National Paddy Precision Farming Project).

Another example is by using image processing. Norazlida Jamil (2014) has reported that thermal image can be used to detect husk and separate it with the seed. In addition, Mehdi Saberioon et al., (2013) have used digital camera image for determining nitrogen status in rice plants, Siti Sharifah et al.,(2014) also used image processing to determine physical rice composition.

Next is the application of drones and sensors to help in daily operations. Drones and sensors help to minimalize works and also decrease human labours in daily field operation. One the major company that used the drone technology is Braintree technologies

Sdn Bhd. which provides services about drone services to helps farmers in the field. According to Directors of Braintree technologies Sdn Bhd, Mr Arif, this company aims on using drones, geographic information systems, artificial intelligence and Internet of Things plans to help Malaysian plantation develop furthers (NST, 2018). In particular, the usage of drones allow farmers to get an overall survey and view of the area and make efficient used of farmers time (Tripicchio et al, 2015).

Besides that, the usage of LiDAR sensors also being used in oil palm plantation to obtain geographic information and also the soil elevation map (Helmi Z.M et al., 2014). This is another alternatives that can be used to substitutes the usage of satellite that will incurred more cost and needed specific to be carried out in that particular area (Balafoutis et al, 2017). Other than that, soil EC mapping also used in plantation area to obtain soil characteristics and properties including chemical and physical properties (Amirun et al., 2007). The example of chemical properties such as nutrient level, pH level and also site yield mapping by using soil Electrical Conductivity or else known as the soil EC mapping.

Challenges of Smart Farming in Oil Palm

There are several challenges that limiting the application of smart farming in Malaysia.

Weak Imperative for Changes

In Malaysia, the farmers and producers still using conventional technology and method. In well develop country the need for spatial is greater because of the principal of stronger imperatives for change and lack of conventional support (Cook et al, 2003). Contrast with what happen in Malaysia, they feel uncertainty with the result come from the smart farming. The unviability of many services and uncertain towards the benefit leads to this weak imperatives for change (Daberkow and McBride, 2003). Moreover, they are still using traditional method due to structural problems as well. These include small farm size and remote locations with limited access to the latest technology and knowledge.

Interoperability of Differents Standards

According to CEO of Tecknoledge software, Hussain Fakhruddin, the innovative technology comes from Original Equipment Manufacturer (OEM) cause several of available tools and technology often not following the same technology standards and platforms. The challenges lies in transforming the smart devices and gateway to become more holistic, hence becoming more farmer-friendly platforms (H. Fakhruddin, 2017).

The Learning Curves

Smart farming involving the implementation of new technology towards day to day field operations, they want more cost-effectives, easy to use and and integrated smart farming systems (Blackmore et al, 2004). Thus the lack of knowledge on several technology and equipment will eventually become disastrous, most important things is to getting the farmers thoroughly understand about the concept of smart farming and every tools involved in this particular.

Connectivity in Rural Areas

Most of the farming and plantations area involves in rural areas, which the implementation of cloud computing technology needs good network perfomance and bandwidth speed (H.Fakhruddin, 2017). Unless this network problem is not solved, then the implementation of several smart farming technology will become problematic. Since most of the sensors and cloud based computing is depends on cloud services, the services and networks needs to be strong enough to be implemented in rural areas (Balafoutis, 2017).

Conclusion

Smart farming is the new era in agricultural sector towards modernizing the agricultural sector in Malaysia and also the world. These include usage of drones or known as unmanned aerial vehicle (UAV) which help in crop maintenance activity such as oil palm census and also other maintenance activity such as circle spraying and selective spraying in the future.

There are several factors that limiting the usage of smart in oil palm plantation in Malaysia which includes the connectivity in rural areas, the learning curves, interoperability of difference standards and weak imperatives for change. All of this particular limitation can be overcome by educating and give more information on smart farming to the farmers. This is because the advantages of smart farming, precision agriculture and also internet of things in agriculture are far outweighing its liabilities and all the limiting factors.

Hence the smart farming is the new era and also will become future farming in plantations sectors. This will open up new job opportunities for the youngster that eager with technological advancement towards working in plantations sectors and will overcome the labour shortage problem

References:

Alam, A S A Ferdous & Er, Ah Choy & Begum, Halima. (2015). Malaysian oil palm industry:Prospect and problem. Journal of Food, Agriculture and Environment. 1313.

143-148.

A. T. Balafoutis, B. Beck, S. Fountas, & S. M. Pederson. (november 2017). Smart Farming Technologies - Description, Taxanomy and Economic Impact. 21-77. doi:10.1007/978-3-319-68715-5_2

Aimrun W., M. S. M. Amin, Desa Ahmad, M. M. Hanafi, C. S. Chan. (2007). Spatial Variability of Bulk Soil Electrical Conductivity in a Malaysian Paddy Field: Key to Soil Management. Paddy and Water Environment.

Ainun Jaabi (2017). Smart Farming is the Way to Go. Retrieved on 9 October 2018 from https://www.nst.com.my/opinion/columnists/2017/09/276234/smart-farming-way-go

Bernama Media Relations and Event Management (MREM). (2017, October 2). Retrieved from http://mrem.bernama.com/viewsm.php?idm=30196

Blackmore B., Fountas Spyros, Søren Marcus and Pedersen. (2004). ICT in Precision Agriculture – diffusion of technology an overview of Precision Agriculture. 10.13140/2.1.1586.5606.

Cook S., Dobermann A., Blackmore, B., Adamchuk Vi. (2004). Precision farming: Challenges and future directions. Published on CDROM. Web site.

Daberkow G. S., McBride D. and William. (2003). Information and the adoption of precision farming technologies. Journal of Agribusiness. 21.

Helmi Z.M. Shafri, Mohd Hasmadi Ismail, Mohd Khairil Mohd Razi, Mohd Izzuddin Anuar and Abdul Rahman Ahmad, (2014). Application of LiDAR and Optical Data for Oil Palm Plantation Management in Malaysia. Article in Proceeding of SPIE Vol. 852608-11– The International Society for Optical Engineering. DOI: 1117/12.979631.

Tripicchio P., Satler M., Dabisias G., Ruffaldi E., & Avizzano C. A. (2015). Towards Smart Farming and Sustainable Agriculture with Drones. 2015 International Conference on Intelligent Environments. doi:10.1109/ie.2015.29

Kevan Reval. (n.d.). What IoT means for Agriculture. Retrieved from http://www.iotamy.com/SmartAgric ulture

Ministry of Plantation industries and commodities. (2009).Retrieved from http://www.Palmoilworld.org/sustainability.html

Malaysian National Paddy Precision Farming Project. Retrieved on 13 February 2019 from https://apan.net/meetings/kualalumpur2009/proposals/Agriculture/APAN%20Eb%20Edit.pdf

Mohammad Mehdi Saberioon, Mohd. Soom Mohd. Amin, Wayayok Aimrun, Asa Gholizadeh and Anuar Abd. Rahim Anuar. (2013). Assessment of colour indices derived from conventional digital camera for determining nitrogen status in rice plants. Journal of Food, Agriculture & Environment Vol.11 (2), 655-662. WFL Publisher. ISSN: 1459-0255

Norazlida Jamil, Siti Khairunniza Bejo, (2014). Husk Detection Using Thermal Imaging Technology. 2nd International Conference on Agriculture and Food Engineering, CAFEi2014. Agriculture and Agricultural Science Procedia 2(2014) 128-135

NST. (2017, September 1). Ecological agriculture: Farming the smart way. Retrieved from https://www.google.com/amp/s/www.nst.com.my/node/275265/amp

International Conference on Agriculture and Food Engineering, CAFEi2014. Agriculture and Agricultural Science Procedia 2(2014) 128-135.

Tripicchio P., Unetti M., Giordani N., Avizzano C. A., and Satler M., (2014). "A lightweight slam algorithm for indoor autonomous navigation," Australasian Conference on Robotics and Automation, ACRA , 2014.

Pedersen, S. M. (2018). Precision agriculture: Technology and economic perspectives. Cham: Springer International Publishing.

Siti Sharifah Bibi Hanibah, Siti Khairunniza-Bejo , Wan Ishak Wan Ismail and Aimrun Wayayok. (2014). Determination of Physical Rice Composition using Image Processing Technique. Journal of Food, Agriculture & EnvironmentVol.12 (1): 205-209.WFL Publisher. ISSN: 1459-0255

V. Puri. (2016). Smart Farming: IoT based smart sensors agriculture stick for live tempreture and moisture monitoring using Arduino, cloud computing and solar technology. 673-680. 10.1201/ 9781315364094-121

Wolfert S., Ge L., Verdouw C., & Bogaardt M. (2017). Big Data in Smart Farming – A review. Agricultural Systems,153, 69-80. doi:10.1016/j.agsy.2017.01.02